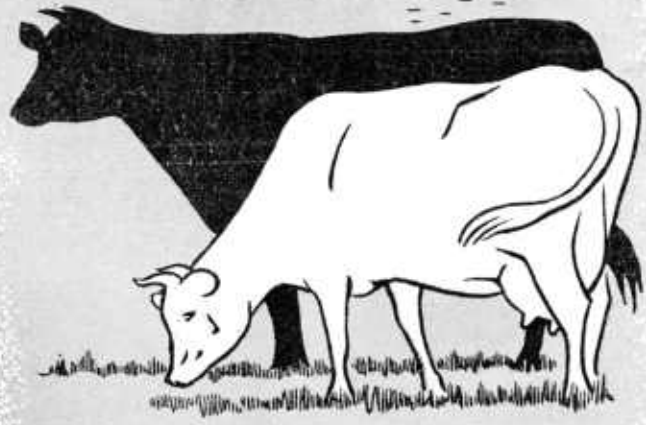

Care and Management of DAIRY COWS

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CONTENTS

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SUCCESS IN DAIRYING depends largely on the proper care and the efficient management of the herd. Unless the dairy farmer is thoroughly acquainted with approved practices he is likely to make many costly mistakes. The purpose of this bulletin is to present important facts pertaining to the care and management of dairy cows and to describe briefly the practices which experience has shown to be good.

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Care and Management of DAIRY COWS [1]

By J. B. Parker and P. C. Underwood,[2] Animal Husbandry Research Division, Agricultural Research Service

CARING FOR THE DRY COW

It is generally considered that a cow should be dry for a time before calving, for four principal reasons: (1) To rest the organs of milk secretion; (2) to permit the nutrients in the feed to be used in developing the fetus instead of in producing milk; (3) to enable the cow to replenish in her body the stores of minerals which may have become depleted through milk production; and (4) to permit her to build up a reserve of body flesh before calving. Practical experience has shown that cows denied a dry period will give less milk the following lactation than those allowed a period of rest.

DRYING OFF

At one time drying off a persistent producer was accomplished with some difficulty because it was thought necessary to treat and feed the cow so that she would be producing not more than a few pounds of milk when milking was stopped entirely. Now we know that cows giving as much as 20 pounds a day will not be injured if milking is discontinued abruptly. Possibly cows producing more than 20 pounds a day can be dried off safely in the same way, but it does not appear best to discontinue milking such cows abruptly. The production can usually be reduced to 20 pounds or less by withholding some of the feed. Then milking can be limited to once a day or once every other day. With cows giving considerable quantities of milk, the udder becomes distended and further secretion is checked when milking is discontinued. The milk in the udder will be reabsorbed gradually. While this is taking place some of the milk will become stringy or lumpy, resembling that produced in some cases of mastitis. One should not be alarmed on finding such milk, as it appears to be a natural occurrence with cows being dried off by this method.

LENGTH OF DRY PERIOD

The length of the dry period required depends on the quantity of

[1] This is a revision of the edition by J. R. Dawson and P. C. Underwood.

[2] Transferred to the Department of Health, Education, and Welfare, October 25, 1953.

milk the cow has been producing and on her condition or fleshiness. The greater her production has been the more likely that her body has been depleted of the nutrients used in milk secretion and the longer the dry period required to replenish the losses and to store adequate reserves for the next lactation. Cows should always be in at least a medium state of flesh at time of calving. For this reason, thin cows should have longer dry periods than those carrying more flesh. Some investigations in England show that the longer the dry period, up to 120 days at least, the greater the yield of milk in the subsequent lactation; however, these progressive increases in yield become less pronounced as the length of the dry period increases. The cost of keeping a cow in a dry condition for a very long period will more than offset the value of the increase in yield. For cows that are well fed and are in good condition at time of drying off, it is suggested that the dry period should be 30 to 60 days, the shorter period being for low producers. Thin cows should be dry for longer periods.

CONDITION OF THE COW AT CALVING TIME

Cows normally lose weight for 3 to 6 weeks after calving, because they cannot consume enough feed to provide adequately for both the milk flow and the maintenance of body weight. Therefore, in order that they may not become too thin after calving, they should carry considerable flesh at calving time. Cows in good condition at calving time will start the lactation period at a higher level of production than will thin cows; this results in a larger yield of milk for the year. Cows need a reserve of body tissues on which to draw until they recover from the effects of calving. There is no economy in having cows thin at calving time. The value of the additional milk yielded by cows in good condition will more than offset the cost of the feed required to put them in good condition.

On the other hand it appears that cows should not be extremely fat at calving time. Very fat cows are likely to have poor appetites after calving and may be troubled with excessive congestion of the udder. The feeder should, to a large extent, be guided by the condition of the cow's udder. If the udder becomes badly swollen, the cow's grain allowance should be reduced.

An investigation at the United States dairy experiment station at Beltsville, Md., showed that liberal feeding (12 pounds of grain a day), as compared with moderate feeding (4 pounds of grain a day), for 2 months before calving failed to change the condition of the cow materially or to increase the quantity of milk produced after calving. Therefore it seems that cows should be so fed during the lactation period that they will be in good flesh when they are dried off. Apparently it is the condition of the cow that counts rather than the level at which she is fed before calving.

The feed during the dry period should contain plenty of protein and minerals, especially calcium (lime) and phosphorus. Legumes, either as pasture or hay, furnish

protein and lime; wheat bran, cottonseed meal, linseed meal, and soybean meal are good sources of both phosphorus and protein. Green grass or other green forage promotes the assimilation of calcium. A dry cow on good pasture will get all the nutrients she requires. However, if it is suspected that the ration fed during the lactation period lacked minerals, steamed bonemeal and salt may be mixed in the proportions of 2 to 4 parts of bonemeal to 1 part of salt and put where the cow can get all she wants of the mixture. In the winter, legume hay of good quality and a grain mixture containing wheat bran, cottonseed meal, linseed meal, or soybean meal will supply the needed minerals. The feeds already mentioned as being high in lime and phosphorus are high in protein also.

CARING FOR THE FRESH COW

AT CALVING TIME

In handling cows that are heavy with calf, care should be taken to prevent them from being injured by slipping on stable floors or on ice, by crowding through doorways, or by mounting cows that may be in heat. Confine all cows that are in heat, or at least separate them from the cows that are heavy with calf. In other particulars, the pregnant cow may be handled like the rest of the herd.

A week or two before the cow is due to calve, keep her under close observation, as she may need special attention when calving. If she has been on pasture, she may be kept there; but her condition should be observed at least twice a day. If she is to calve in winter, place her in a clean, roomy, well-bedded box stall. Sometimes the udder becomes so large and swollen that it is desirable to draw out some of the milk before she calves; this, however, is seldom necessary and should be avoided if possible, because it stimulates further secretion and because the first milk (colostrum) is beneficial to the calf. Keep the cow as quiet as possible; dogs and small children are likely to excite her at this time. Feed her a laxative ration; wheat bran and linseed meal are especially good.

Immediately after the cow has calved, give her warm water to drink if the weather is cold. If the cow becomes chilled at this time, the afterbirth may not be passed so readily, and she may be predisposed to other ailments. It is also best not to draw all the milk from the udder for a day or two after the calving. Leaving some of this milk may help to prevent milk fever.

After a couple of days, under normal conditions, the cow may be placed in the stable with the milking herd. The calf may be removed from her at once or at any time thereafter, but in any event it should receive the colostrum milk until the milk is fit for human use. The sooner the calf is taken away the less the cow will fret over its loss, although the calf may thrive better if left with its mother for 12 hours to 2 or 3 days, especially if it is weak or may suffer from the cold.

Give the cow as much roughage as she will eat, provided she is accustomed to a liberal allowance of

roughage, but feed concentrates sparingly at first and then increase gradually. Take at least 3 weeks to get the cow up to full feed. Too much concentrated feed at this time is likely to cause digestive disturbances and to hinder the reduction of swelling in the udder. In general, it is better to err in not giving sufficient concentrates than in giving too much. The quantity to be given just after calving is usually 4 to 8 pounds a day, depending upon the size of the cow, her production, and the quantity she was accustomed to before calving.

SEASON OF YEAR FOR FRESHENING

Table 1 is based on a study of more than 39,000 cows, selected at random, from herds belonging to members of dairy-herd-improvement associations and shows the relative production by cows that freshened in different seasons.

The cows that freshened in the fall ranked highest, the cows that freshened in the winter ranked second, and the cows that freshened in the summer ranked lowest in average yearly production.

The income over cost of feed was slightly greater for the cows freshening in the fall and winter than for those freshening in the spring and summer. The difference, however, would not justify holding cows over in a dry state from one season to another in order to have them calve at the most favorable season. Perhaps in some localities the conditions as regards markets and feeds will vary enough from the averages as given to make holding cows over from one season to another profitable. The problem must be worked out by each farmer. The biggest difference will come in the seasonal prices of milk and feed rather than in the quantity of milk produced.

Cows that calve in the spring usually give a big flow of milk early in the summer, when butterfat is usually low in price. They are very likely to suffer a severe setback in milk production later in the summer because of heat, flies, and short pasture. It is difficult to get them back to high production in the fall and winter; consequently, they must be carried through the winter on expensive feeds with a very small margin of profit.

TABLE 1.—*Season of freshening, with average yearly records of production*

Season of freshening	Cows	Average production	
		Milk	Butterfat
	Number	*Pounds*	*Pounds*
Spring (March–May)	8, 624	8, 880	363
Summer (June–August)	7, 514	8, 549	349
Fall (September–November)	12, 749	9, 147	371
Winter (December–February)	10, 797	9, 095	371
Total or average	39, 684	8, 962	365

There are several advantages in having cows freshen in the fall. Butterfat usually brings a higher price then and in the winter. Labor is easier to obtain, and there is more time to care for the calves and for a large supply of milk. Fall-dropped calves are easier to raise and usually are less subject to disease. The fall-freshening cows, if properly fed and handled, as a rule produce well in winter and fall off as spring opens. At this time, however, the spring pasture acts as a stimulus and causes increased production in spring and early summer. Their period of lowest production is July and August, when conditions are likely to be unfavorable for high production.

However, in localities where the pasture season is long and grass abundant, it may be more economical to have cows freshen in the spring and produce most of their milk on pasture.

The dairyman who sells his milk to a city retail trade should have some cows freshening at all seasons of the year in order to keep up a steady flow of milk. This matter is not so important for dairymen who separate the milk, sell the cream, and use the skim milk for feeding.

METHOD AND ORDER OF FEEDING

The quantity of grain to be fed to each cow should be carefully determined. A number of methods for feeding the grain are in use, but the most practical is to place a general herd mixture in a truck or cart that is pushed through the feeding alley and to weigh or measure the quantity for each animal (fig. 1). Some cows may need certain feeds that are not included in the herd mixture, but these cows can easily be fed later. A feeding card or sheet showing the quantity of feed each cow is to get should be used. A small blackboard can be attached to the feed cart and the figures placed on this board or these figures can be placed on a card or blackboard in front of or above the cow. A spring-balance scale suspended on an arm above the cart will be of great help.

Silage can be fed from the same or a similar cart. If an occasional scoopful of silage is weighed as a check, the quantity which is being fed can be measured with a fair degree of accuracy by counting the scoopfuls.

If loose hay is fed, the hay chutes should be placed conveniently so that the feeding requires as little work as possible. Occasional weights of hay should be taken in order to feed cows economically and efficiently.

Feed cows regularly, because they are probably more sensitive to change in the feeding routine than to a variation in the hours of milking. Grain is usually fed before milking and the roughage afterward. This practice tends to avoid dust in the stable air during milking. Silage and other feeds that might taint the milk should be fed after milking. Feed about half the grain and roughage in the morning and half in the evening.

At Beltsville, roughage intake was increased and the concentrate allowance was decreased by feeding

FIGURE 1.—Feeding grain from a truck.

about 60 percent of the roughage in the evening and 40 percent in the morning. If cows are milked oftener than twice a day, the grain feeding may correspond but the roughage can still be fed twice a day. Detailed information on feeding is given in Farmers' Bulletin 1626, Feeding Dairy Cows.

SUPPLYING SALT AND MINERALS

Dairy cows should have all the salt they want. The demand for salt will vary with the size of the cow and the quantity of milk she is giving. Experiments have shown that a cow needs 0.75 ounce of salt a day for 1,000 pounds live weight and 0.3 ounce for each 10 pounds of

milk produced. The common practice is to mix salt with the grain at the rate of 1 pound of salt to 100 pounds of grain. Assuming that the grain is fed in proportion to the milk produced, it appears that the higher-producing cows will receive enough salt in the grain mixture but that the lower-producing cows may not get as much as they need. Cows should be allowed access to salt at will at least once a day in addition to what they get in their grain. Rock salt can be placed at convenient places in the pastures or yards, or if granular salt is used it should be put in a covered box so that it will be sheltered from the rain (fig. 2).

In some regions where the forage grown is deficient in phosphorus or calcium, and in other places where feeds naturally low in phosphorus or calcium are used, it is desirable to allow cows free access to steamed bonemeal in a covered box similar to that suggested for salt. Bonemeal steamed enough to destroy any organisms of disease but not enough to remove most of the organic matter from the bone is better for feeding in this way than the specially steamed bonemeal, because of its greater palatability. Mix it with salt in the proportion of 2 to 4 parts of bonemeal to 1 part of salt.

The feed grown in some areas is known to be deficient in other necessary minerals. State agricultural experiment stations can give advice concerning the minerals to feed under their local conditions.

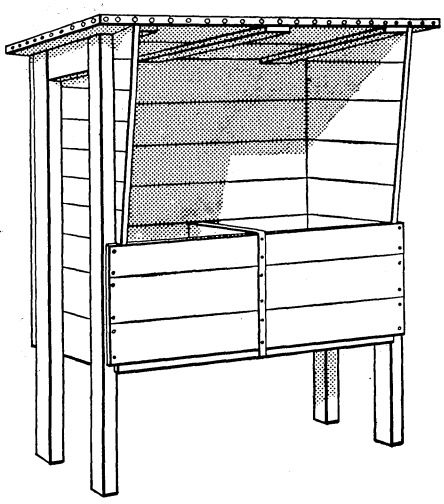

FIGURE 2.—Salt box with roof to keep out the rain.

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WATERING

A plentiful supply of fresh, clean water is essential on the dairy farm (fig. 3). The dairy cow's demand for water depends mainly upon the air temperature, the quantity of milk produced, and the amount of succulent feed in the ration. The quantity of water drunk in cold weather is about the same as that drunk in moderate weather but much smaller than that drunk in hot weather.

In experiments at the dairy experiment station at Beltsville, cows were watered once a day, twice a day, and at will from watering cups. When they were watered once a day, they drank less water and produced less milk than when watered twice a day or at will. When they were watered twice a day, they drank as much but produced less than when they were watered at will. The cows used were average producers. The greatest difference in production was between the cows watered

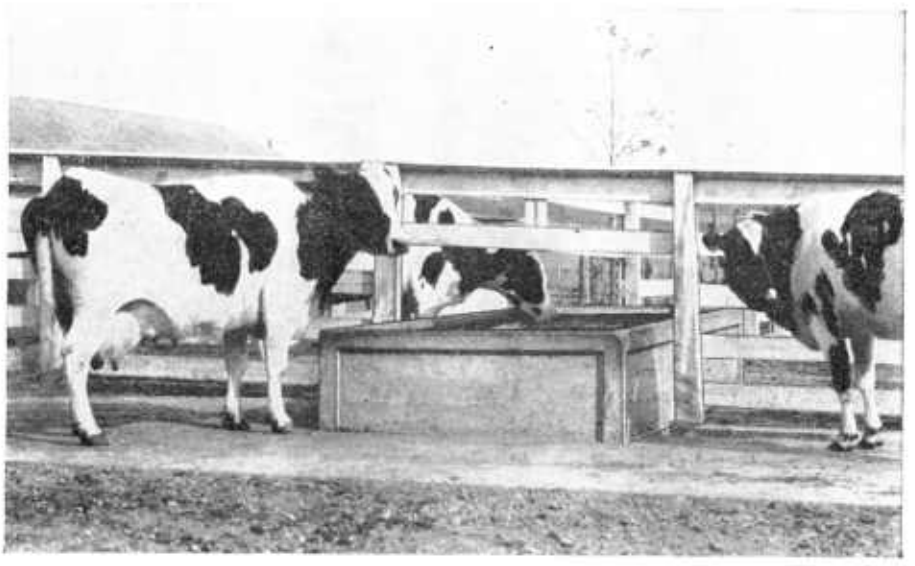

FIGURE 3.—A practical concrete watering tank, accessible from three lots.

once a day and those having water at will. This amounted to about 5 percent. The higher the production, the greater the benefit from frequent watering. Some low-producing cows fed silage, hay, and grain refused to drink more than once a day in cold weather. Cows producing similarly and receiving the same kind of feed drank 80 percent more water in summer than in winter. The demand for water was greatest after eating hay. In cold weather cows prefer water that has been warmed and will drink more of it, though experiments at several stations show that the amount of milk produced is influenced but little by warming the drinking water.

In cold climates when the outside supply of water is likely to be frozen, the easiest way to water cows is through the use of watering bowls in the barn. In milder climates, where the cows are not stabled so constantly, one may more readily forego the use of watering bowls. If watering is to be done twice a day, the best times are immediately after the cows have had a chance to eat most or all of their dry feed.

MILKING

REGULARITY

Of all the operations having to do with the production of milk, the act of milking takes the most time and to many persons is the most irksome. Doubtless this feeling has come about partly because of the common belief that cows should always be milked not only at the same hours each day but also by the same person for the most satisfactory results.

While such an arrangement would be ideal, experiments have shown that average to good cows

may be milked at rather irregular hours without any marked effect upon the production provided the other operations, particularly feeding, are carried on in a regular manner. When irregular milking was accompanied by irregular feeding, the production was lessened by about 5 percent. To what extent very high producers and very low producers would be affected has not been determined. It is not to be concluded from this that regularity in doing the dairy work is of little importance, but rather that occasional deviations may be safely made from a set schedule when other work is pressing.

In spite of the rather general belief that a cow will produce more milk if always milked by the same person, the practice in many of the larger dairies is to milk the cows as they come rather than to have each person always milk the same cows. This serves to equalize the work, and if the cows are acquainted with all the milkers they will probably give as much or nearly as much milk as if they were always milked by the same person. Some milkers are naturally more efficient than others. Changing from a good to a poor milker will result in less milk; changing from a poor to a good milker will result in more milk, provided strangeness is not a disturbing factor.

FREQUENCY

Between one milking and the next the udder gradually fills with milk. The "giving down" of the milk is mostly caused by releasing the milk into the milk cisterns and teats, where it can be drawn, rather than by actual secretion at the time. As the udder becomes distended with milk, secretion is less active and the greater the distention and pressure the more pronounced is the check upon secretion. This is the principal if not the only explanation for the increase in production obtained by more frequent milking.

The increase to be expected by milking cows three times a day instead of twice will vary from about 10 percent for short periods of a month or so up to 15 percent for whole lactations. Cows milked three times a day produce more persistently. The percentage of butterfat in the milk is not affected. It is believed that one can safely estimate an increase of 15 percent by milking three times a day instead of twice, if the more frequent milking is done for the entire lactation period and if enough feed is provided for the extra milk produced. Whether it will pay to milk cows three times a day instead of twice must be determined by the individual dairyman. The profit depends upon the quantity of production, the length of time the extra milking is to be practiced, the cost of doing the extra milking, the cost of extra grain that must be fed, and the value of the product. For each extra pound of milk produced, one must allow 0.4 to 0.6 pound of grain, depending upon the richness of the milk. In general, it appears that high-producing cows whose product is disposed of at good prices can be milked profitably three times a day, especially if a milking machine is used. On the other hand, with low-

or medium-producing cows whose product is used for making butter, cheese, or condensed milk, it would not be profitable to milk more than twice a day.

INTERVALS BETWEEN MILKINGS

When the intervals between milkings are unequal, the larger quantity of milk and the lower percentage of fat in the milk tends to follow the longer interval. However, if the longer or shorter interval is continued successively, the percentage of fat in the milk is not changed from the percentage which is normal for the cow. For example, if the hours of milking are 6 in the morning and 4 in the afternoon, the afternoon milking will be smaller in quantity but richer in fat than the morning milking. However, any interval, whether short or long, if practiced continuously fails to affect the normal percentage of butterfat. A cow may be milked twice a day or three times a day without raising or lowering the percentage of fat in the milk. The percentage of fat in the milk is a fixed characteristic and can be changed only temporarily by varying the hours of milking. Any fat that is left at one milking will be recovered at the next or subsequent milkings. An exception to the above statements may be made: It has been found by some investigators that if the night and day intervals of milking are equal, the morning's milk will be slightly greater in quantity and slightly lower in percentage of fat than the evening's milk. Exercise has been found to increase slightly the percentage of fat in the milk. Possibly the fact that cows are more active during the day will explain why the evening's milk contains a slightly higher percentage of fat than morning's milk.

MILKING BY HAND

The requirements of good hand milking are to draw the milk quickly and without discomfort to the cows, to keep the milk clean, and to get all the milk. Milking requires considerable skill, and some persons never learn to be good milkers. The most successful milkers use the whole hand rather than the thumb and index finger; they milk rapidly and continuously; they milk with dry hands; they avoid strong downward pulling and jerking on the teats, as well as grasping and bruising the udder. Loud, boisterous talking tends to excite the cow, but so far as known, singing or whistling is not objectionable. Rough treatment and shouting at the cow while milking or at any other time is not conducive to the most liberal yields of milk.

Wet-hand milking is insanitary and in cold weather the teats of cows milked wet are more likely to chap. The order in which the quarters are milked seems to make no difference in the total production. One may follow whatever order appears to be the most convenient. If some of the teats are too small to grasp with the whole hand, it may be easier to milk such teats first than to milk them last when the lower part of the udder is distended with milk.

In general, 6 to 10 cows can be

milked by a person in an hour, depending on how hard the cows are to milk, the quantity they are giving, and how far the milk must be carried. Ordinarily, 8 cows an hour would be classed as good hand milking.

The intent should be to get all the milk if it can be done without taking too much time. As the secretion of milk is a continuous process, it is almost impossible to get the "last drop." Furthermore, to try to do so may not be worth the time it takes. Some milk is always left in the udder, and investigations have shown that leaving a pound or so does not harm the udder or cause the cows to dry off rapidly. The last milk secreted is richest in butterfat. A single incomplete milking will have a lower percentage of butterfat than complete milkings before and after, but if incomplete milking is continued the percentage of butterfat in the milk will be the same for incomplete milking as for complete milking. It has been estimated that about half of the milk left in the udder is recovered at subsequent milkings. Stripping should not be continued for so long that the value of the milk obtained by stripping fails to cover the value of the time spent in doing the stripping.

MILKING BY MACHINE

The milking machine has proved to be practicable on a great number of dairy farms. Its principal advantage is the saving in labor. A herd of cows can be milked by machine in from one-third to one-half the time required to milk them by hand. The machine also protects the milk from contamination by the milker and by dirt falling off the udder and flanks of the cow. Therefore, if all parts of the machine with which milk comes in contact are carefully cleaned and treated to kill bacteria, the milk drawn by machine should be cleaner than that drawn by hand. The yield by machine milking for the lactation period is as great as would be obtained by medium to good hand milkers, but is probably not as great as would be obtained by the best hand milkers. Cows milked by machine often lack the persistency of those milked by good hand milkers.

In some herds the milking machine has been used for many years without apparent damage to the udders of the cows; in other herds where the machine has been carelessly or improperly used there is evidence that it may contribute to the occurrence of mastitis. The method of operating the machine for the best results has not been definitely determined, but there seems to be a fairly universal agreement on two points—one is that the teat cups should not remain attached after the milk ceases to flow, and the other is that an excessive vacuum should be avoided.

Each milker usually operates from 2 to 4 units, the number depending on whether he or some other person strips the cows and on whether manipulation or hand stripping is practiced to get the last of the milk. The maximum number that can be milked per unit per hour is 10 cows. One man with 2 units can

milk and strip by hand as many as 20 cows an hour. One man with 3 units can milk 25 cows an hour if manipulation of the udder is practiced in lieu of hand stripping. One man with 4 units can milk 40 cows an hour if some other person does the stripping. Additional time must be allowed for getting milk to the cooling room. This may amount to very little if the practice is to pour the milk into cans in the barn and then carry the milk to a nearby cooling room, but it may amount to considerable if the practice is to take each cow's milk directly to the cooling room. Rapid milking is preferable to slow milking not only because of the saving in time, but because of the possibility that long-continued suction on the teats may be harmful; also, many dairymen believe that slow milking may cause cows to develop the habit of giving down their milk slowly.

Manipulating the udder to complete the milking process, instead of stripping by hand, consists in pulling down on the claw of the teat cups while gently squeezing and massaging the lower part of the udder. This requires from only a few seconds to a minute or more, depending on the individual differences in the cows and on the completeness of milking. If an attempt is made to get all the milk, the saving in time over hand stripping is slight. Manipulation lessens the possibility of contamination by the milker and by dirt from the cow; also, the milk from the cow is all drawn into one container so that the weights are recorded more conveniently than if the strippings are handled separately from the rest of the milk. Manipulation may prove unsatisfactory for inexpert machine operators, particularly with the bucket-type machines, because of the inability to judge when the milking is properly completed. Unless there are serious objections to hand stripping on sanitary grounds, it is generally considered more satisfactory with the bucket-type machines to strip by hand than to practice manipulation.

In recent years a method of machine milking has come into use in certain dairies making a specialty of clean milk. The cows are taken to a separate room for milking, usually being stopped en route to have their udders washed and dried. This separate room is commonly called a "milking parlor." The milk is drawn by machine into glass pails suspended on spring scales, and from these pails it is drawn by vacuum into an adjoining room for collection in cans or for cooling. As soon as a cow is milked she is released and another takes her place. One man handles two to four units, and manipulation instead of hand stripping is usually practiced.

Much attention is now being directed to a milking method termed "managed" milking or "quick" milking. Investigators have found that a hormone which is produced in the cow's pituitary gland aids in contracting the muscles that force the milk out of the secretory cells in the udder. The action or stimulation caused by this hormone lasts only a few minutes. Managed or

quick milking is practiced in order to take advantage of this action.

Production of the hormone is stimulated by massaging the floor of the udder and teats several times with a towel that has been immersed in warm water. After about a minute of massaging, the let-down of the milk occurs. If cows are milked by hand, milking should be started immediately. If they are milked by machine, one should wait 1 or 2 minutes before attaching the machine. The milk will be given down rapidly and the teat cups should be removed when the cow is dry. Milking will usually be completed in 2½ to 3 minutes.

Managed milking not only takes less time than the usual methods, but the teat cups are removed sooner and the danger of udder injury is minimized. Evidence shows that if the procedure is carried out carefully there will be just as much milk as was produced when the usual methods were used and oftentimes more.

HOUSING DAIRY COWS

The main requirements in housing dairy cattle in the winter are to keep them dry and out of the wind and drafts and to provide plenty of fresh air and sunlight. The temperature of the dairy barn, if it is of the closed type, should not fall below freezing; but if the cows are kept in an open barn or shed where they may move about at will they will suffer no ill effects from somewhat lower temperatures. In the severe winter weather of North Dakota, cows have been found to thrive in open sheds where little protection was afforded against the low temperatures but where they were kept dry and out of the wind. The coats of hair on the cows become long or short as required to keep them warm or cool. For this reason sudden changing from a warm barn to a cold one should be avoided. Investigations have indicated that the optimum temperature for well-fed dairy cows kept in a barn free from drafts is 50° to 55° F. Rather wide variations from the optimum are possible without any noticeable adverse effect.

Over most of the United States the summer temperatures appear to be more trying than the winter temperatures. Average temperatures exceeding 85° F. for more than 48 hours were found at the California Agricultural Experiment Station to increase the body temperatures and to lower the production of milk. Experiments in the Gulf Coast region of Louisiana showed there was a definite relationship between the body temperatures of the cows and the temperature of the air. The average body temperature of the cows ranged from 101.1° to 103.2° F. as the average air temperature ranged from 50° to 95°. Keeping the cows in the sun at high air temperatures caused an average rise of 0.7° in body temperature as compared with keeping the same cows in the shade at the same air temperature. In case cows are to be housed in the summer, provision should be made to get the full benefit of all cooling breezes. The windows can be

made low and the sash removed in hot weather, or with some types of barns the sides can be removed or swung up to permit unrestricted air circulation.

TYPES OF BARNS

Various types of barns are used to house dairy cattle. The most common type of barn in the northern part of the United States is one in which the hay is stored in the loft above the cows (fig. 4). This construction usually puts the feed in a more convenient position than if the cows and feed are under separate roofs. In the southern part of the United States where the need for hay storage is less pronounced the one-story barn (fig. 5) is more widely used than it is in the North. The open type of barn or shed (figs. 6 and 7), where the cows run loose either together or separated into groups, is being used to some extent in all parts of the United States, but it is better adapted to those regions where bedding is cheap and plentiful and where an abundance of hay is grown and fed than to those where such materials are less plentiful. The better saving of fertilizing constituents of the manure in the open shed may partly or completely offset the increased cost of the bedding required.

FIGURE 4.—A group of two-story barns. Note the ample space for hay storage.

FIGURE 5.—A one-story cow barn with silos.

FIGURE 6.—A two-story shed adjoining a two-story barn. Milking barn in between.

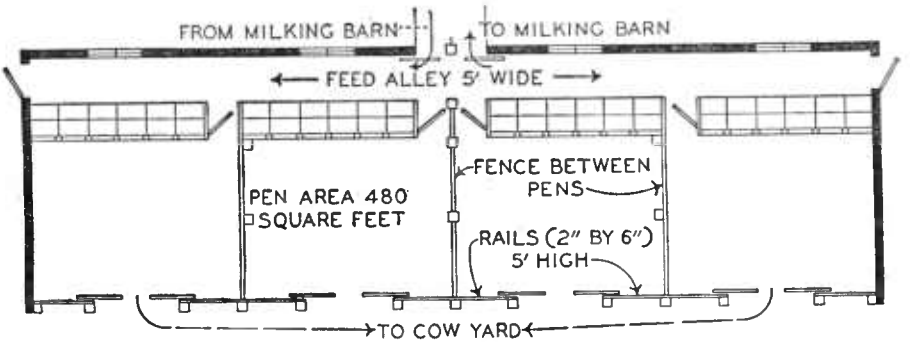

FIGURE 7.—Plan for an open barn (30 x 98 feet) with pens for separate groups of cows and stanchions and mangers for individual feeding.

For further information on types of barns see AIB 98, Loose Housing for Dairy Cattle, and AIB 123, Stall Barns for Dairy Cattle.

The ordinary type of dairy barn in which the cows are kept in individual stalls has the advantage over the open type of barn in that each cow can be fed individually, less bedding is required, the cows are conveniently placed for milking and showing, and the more timid cows are protected from the "boss" cows.

The open barn or shed is advantageous in that it provides the best known method of saving the fertilizing constituents of the manure; it permits the feeding of rough materials, such as corn stover, under shelter; and makes possible the use of the uneaten portions for bedding. The manure does not have to be removed each day, and if the feeding racks are large enough, a supply of hay sufficient to last for several days may be put in them at one time. The open barn is not likely to make any less total work, but it will lessen slightly the work that must be done regularly every day. All cows kept in the open barn should be dehorned, and some provision should be made to insure the timid cows of their proper share of the feed. A separate room or

barn in which to milk the cows should be provided.

Figure 7 shows a plan of an open barn for housing cows in groups, each pen being provided with inexpensive mangers and stanchions for tying the cows while being fed. The size of pen shown is suitable for six large cows. Less floor and manger space is needed for smaller cows. For example, for large cows (Holstein-Friesian and Brown Swiss) allow 70 to 80 square feet of floor space per cow, for medium-sized cows (Ayrshire and Guernsey) 70 square feet, and for Jersey cows about 60 to 65 square feet. This barn is suitable for moderate climates; more window space for additional circulation of air should be provided in warm climates. In extremely cold climates, fewer windows would be desirable, and the open front may be so arranged that it can be closed by means of doors that slide back along the partitions. This type of structure is inexpensive and provides for easy expansion. The most convenient number of cows per pen depends somewhat on the number handled and milked as a group in the milking barn. The optimum number for maximum production has not been determined, but it has been found that with the same allowance in square feet per cow the space and bedding are utilized better in large pens than in small ones.

Experiments at the United States dairy field station at Huntley, Mont., showed that cows kept in a pen barn were more comfortable than cows kept in stanchions. The cows in the pen barn showed less stiffness and lameness in their legs and produced from 8 to 19 percent more milk than the cows in stanchions, the amount of the increase depending on the ration fed.

FLOORS, VENTILATION, WINDOWS

Concrete generally is the cheapest, most durable, and most sanitary floor. A common mistake in laying concrete floors is to make them so smooth that cows will slip and fall on them when the floors are wet. Especial care should be taken to roughen the alleys where the cows walk. This can be done with a wire brush or broom after the concrete has been floated but before it has hardened. Roughening an old floor is a laborious job; probably an ax is about the best and easiest tool to use. Dirt floors should not be used in a milking stable. They are insanitary, they cannot be flushed and kept clean, and the cows soon wear or tramp holes in them.

Comparatively few of the barns in the northern part of the United States are well ventilated. One reason for this is that ventilating systems that depend on differences in the temperature of the air inside and outside the stable do not always change the air in the barn often enough. The outlet flue must be of ample size, tight, and well-insulated; the sides of the barn and the windows should be tight; and there should be built-in arrangements for admitting the fresh air. On farms having electricity these systems are being supplemented or replaced with electric fans which remove the air from the barns. In milder cli-

mates the tilting window is a cheap and practicable method of ventilation.

STALL EQUIPMENT

Of the various methods of confining cows, the swinging stanchion has met with the greatest approval. Types of such stanchions are shown in figure 8. Some dairymen prefer to give the cows a little more freedom of movement than is permitted by stanchions. This additional freedom is afforded by the type of tie shown in figure 9, which has sliding chains attached to a neck strap.

Some dairymen who are intent on providing optimum conditions regardless of expense keep their cows in box stalls. Cows so kept will produce a little more milk than if kept in stanchions, but the increase is not enough to pay for the extra labor and bedding required. Box stalls require more space than stanchions, the labor of feeding the cows and removing the manure is increased, and about three times as much bedding is used. There is no doubt that cows kept in box stalls are more comfortable and are less likely to have their teats injured by being stepped on by other cows. On dairy farms run primarily for profit, box stalls should be used only for cows that are ill or are freshening. Ordinarily 10 percent as many box stalls as milking cows will be plenty.

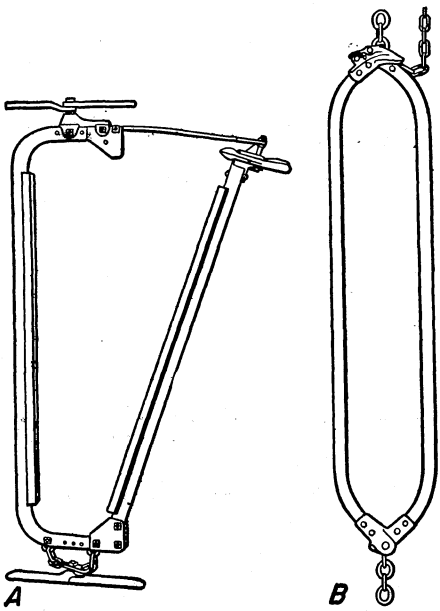

FIGURE 8.—Types of swing stanchions: *A*, Metal reinforced with wood; *B*, tubular.

An investigation conducted at the United States dairy experiment station at Beltsville showed that cows produced about 50 percent more milk when kept under optimum conditions than when kept under conditions such as would be found on an ordinary good dairy farm. Other investigators have found as much as a 70-percent increase. This 50- to 70-percent increase can be accounted for by extra milkings, use of box stalls instead of stanchions, milking for 12-month lactations instead of 10 months, more liberal feeding, and feeding of choicer feeds.

EXERCISE

To prevent cows confined in stanchions from becoming stiff, they should be turned out at least once a day. When the cows are out, the stables are easier to clean and bed, and opportunity is afforded for observing any cows that may be in heat. Cows require no more exercise than is obtained in walking at will about a small yard. Exercise

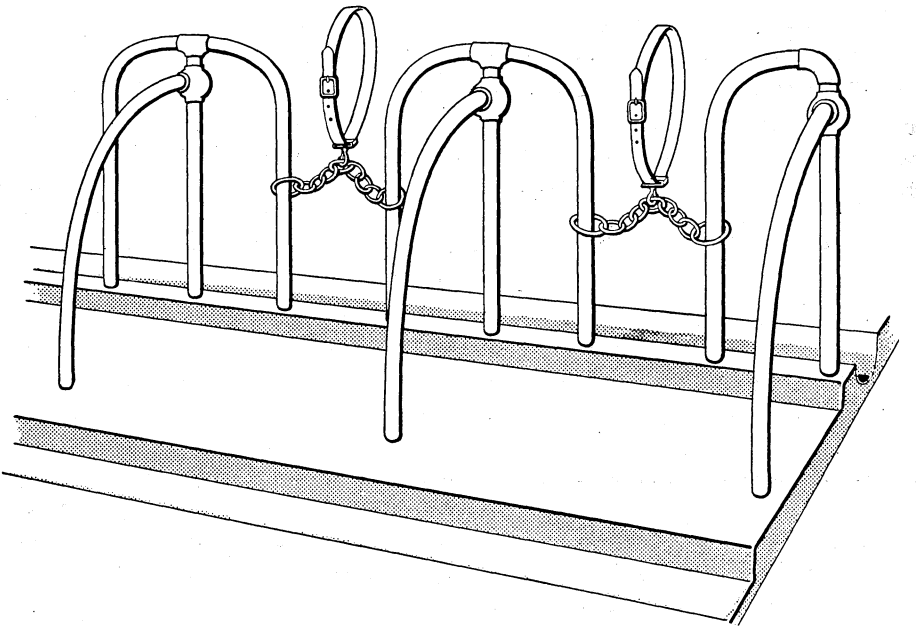

FIGURE 9.—A tie with sliding chains attached to a neck strap.

has been found to increase slightly the efficiency of digestion and the percentage of fat in the milk.

CLEANLINESS

GROOMING

Grooming cows daily, removing manure or litter from their bodies, not only improves the appearance of their coats, but also makes possible the production of cleaner milk. Washing and carding the tails occasionally adds much to the appearance of the herd. Vacuum grooming of cows in box stalls for a period of 4 months, at the Agricultural Research Center, Beltsville, Md., took more time than hand grooming and increased production only slightly. The cleanliness of the cows under the two methods of grooming was not noticeably different.

BEDDING

Bedding is used (1) to provide a comfortable bed, (2) to keep the cow clean, and (3) to absorb the liquid manure. The common bedding materials are wheat straw, oat straw, corn stover, shavings, and sawdust. The desirable qualities of a bedding material are bulkiness, large liquid-holding capacity, high fertilizing value, and freedom from dust.

Straw and shredded corn stover are more bulky than shavings or sawdust.

In liquid-holding capacity the following materials rank in the order named: Shredded or cut corn stover, straw, and shavings or sawdust. Corn stover has the greatest fertilizing value. Oat straw and wheat straw follow in the order named. Sawdust and shavings have only a small fertilizing value.

Shavings are the cleanest form of bedding and for this reason are much used in dairies where very clean milk is produced. In dairies where extra sanitation is not a matter of importance, shredded stover or straw is worth at least 50 percent more than sawdust or shavings. About 4 to 6 pounds of wheat straw per cow per day provides a suitable bed and keeps the cows clean when they are confined in stanchions. This quantity is not sufficient to absorb all the liquid manure; to do this, about 8 pounds per cow would be required for an average-producing herd. Cows in box stalls need about 14 pounds daily of wheat straw.

Dry, baled peat moss is used to a limited extent in dairies. In ability to absorb liquids it far exceeds any other bedding material, but in practice about as much peat moss as wheat straw is used per cow per day, as the quantity of bedding used depends more on its bulk than on its liquid-holding capacity. Experiments show that flies breed as readily in soiled peat moss as in soiled straw.

PAINTING AND WHITEWASHING THE STABLE

If the inside of the cow stable is to be painted, the woodwork or plastering should be smooth to avoid using excessive quantities of paint. A rough surface is preferable for whitewashing because the whitewash will adhere to it better than to a smooth surface. As compounds of lead are poisonous to cattle it is better to use paints that do not contain lead around the stalls and pens where it may be licked or gnawed off. Elsewhere lead paints may be used. Paint while still wet is likely to be licked off by cattle; paint rags are likely to be chewed; and even buckets that have been used for the paint are dangerous. The lead is a deadly poison. Cattle must be kept away from the paint until it is dry, and all materials and utensils used in painting must be removed from the cowyards and stables.

Cow stables are usually whitewashed once or twice a year. Many whitewash formulas call for adding other substances such as salt or skim milk to the lime and water. Just how much advantage there is in adding such materials is a matter of conjecture. Satisfactory whitewash can be made by the use of lime and water only. The commercially prepared hydrate of lime makes a good whitewash when mixed with water; quicklime, ordinarily called lump lime, may be slaked with a minimum quantity of water and used instead. Only freshly burned lump line should be used, and any that is air-slaked should be discarded, as whitewash made from such lime will not stick.

Whitewash may be applied with a brush or with a spray pump. It can be applied more heavily with a brush, and sometimes one coat so applied will give as good results as two with a sprayer. Spraying, of course, is quicker but smears the floor and stable equipment more than applying whitewash with the brush. Whatever method of application is used, time in cleaning will be saved if the stable equipment is covered with old bags or

similar material. If the floor is kept wet while the whitewashing is in progress, the whitewash that is dropped can readily be dislodged with water and a brush or broom.

DISPOSING OF MANURE

The advice generally given for handling manure on the dairy farm is to spread the manure on the land as soon as possible after it is made (fig. 10). With certain reservations, this seems to be sound advice. It is questionable whether manure handled in this way in the winter gives greater returns than manure which has been properly stored, but the practice does give better distribution to farm labor and obviates the necessity for providing large storage facilities.

Spreading manure on snow, though often advised, is a questionable practice on account of washing, especially if the land is rolling. Probably it is also inadvisable to haul manure onto the fields when the ground is so soft that the wagon makes deep ruts. If the ground is soft or covered with snow, it is better to pile the manure on high ground along the side of the field to be manured, in such a way that any leachings will run onto rather than off the field. This puts the manure in convenient position to spread when conditions are favorable.

When farm work is pressing, manure hauling to the fields must be delayed. Storage of manure cannot well be entirely avoided, therefore, and a suitable storage place should

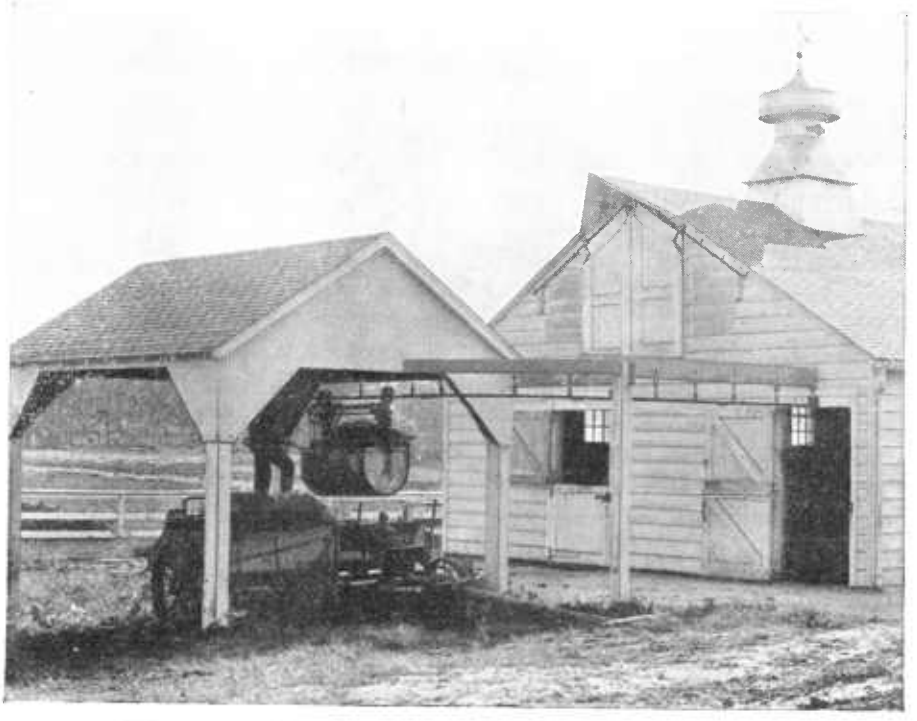

FIGURE 10.—Loading out manure from the barn to the spreader.

be provided in order to prevent excessive loss of fertilizing ingredients. In storing manure, plenty of moisture and thorough packing are the main things to consider. Where bedding is cheap, enough can be used to absorb the liquid manure; where it is costly the liquid can be drained into a cistern, or stored with the solid manure in a watertight manure pit.

Experiments at the United States dairy field station at Woodward, Okla., showed that the liquid manure lost down the gutter drain or by failure to be absorbed in the gutter amounted to 18 percent of the amount voided. The annual loss of nitrogen amounted to about $3 for each 1,000-pound cow stabled the entire year. Such losses could be avoided by providing a tank into which the liquid manure could drain, or by keeping the cows in a loafing barn where fresh bedding could be added daily to absorb all the liquid manure. All manure should be removed from the stanchion barns at least once a day. In well-bedded open sheds or barns where the cows are loose, the manure may be allowed to accumulate for several months and be removed when it is convenient.

The equipment used in removing manure ranges from a wheelbarrow to a power conveyor running in the gutter behind the cows. In dairies of medium to large size the most popular device is the litter carrier with overhead track such as is manufactured by several barn-equipment firms. The carrier may discharge directly into a manure spreader or wagon or may go to a manure pit or other storage place. Power-lift loaders on tractors are also coming into general use. They are especially suitable for cleaning the manure out of pens, lots, and open sheds.

KEEPING RECORDS

In order to manage a herd of dairy cows properly, it is necessary to keep records. The record system need not be elaborate but should furnish accurate information on the milk and butterfat production of the individual cows and on the quantity of feed consumed. In addition, breeding records, and breeding and calving dates should be recorded, and a plan of identifying and recording the animals should be followed. One should not rely on memory for such information, but should put every item down in writing in such a manner that it can easily be referred to when the need arises. The records should not be allowed to lapse.

PRODUCTION RECORDS

The principal object of keeping milk-production records is to show definitely which cows are profitable and which are not. The inferior cows can then be disposed of and the better ones kept for production and breeding.

Another important advantage of milk-production records is that they can be used as a basis for determining rations. Cows should be fed according to the quantity of milk or butterfat they produce. Sickness or other abnormal conditions are generally preceded or accompanied by a decrease in milk

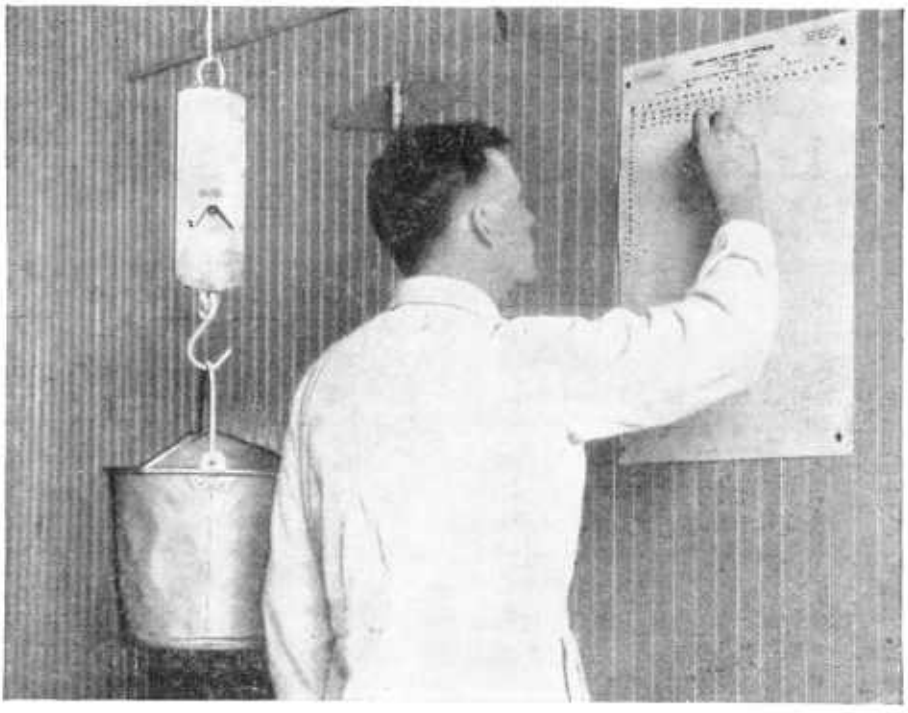

FIGURE 11.—Milk-production records show the profitable cows.

production. The practice of weighing and recording the milk each day helps to detect troubles at their onset.

Spring-balance scales are necessary. These scales are equipped with adjustable hands, one of which is set at zero when an empty pail is hung on the scale. The quantity of milk may then be read without subtracting the weight of the pail. The milk scales should be graduated to tenths of a pound. If milk pails of different sizes are used by the milkers, it is a good idea to keep a weigh pail at the scales to avoid confusion. The scales should be hung in a convenient place in the barn or milk room.

A suitable sheet on which to record the weight of milk from each cow should be placed in a clean, protected place near the scales (fig. 11). Spaces are provided on these sheets in which to write the name or number of each cow and to record the weights of the milk for each milking during the day. Some sheets have spaces for 7 days only, but sheets with spaces for an entire month are most commonly used. Scales and milk sheets can be obtained from dairy-supply houses. Many publishers of dairy periodicals also distribute milk sheets at nominal prices.

At regular intervals a composite sample of milk from each cow should be tested for butterfat. This composite sample is obtained as follows: For 1 day or 2 consecutive days each month take a sample

of each cow's milk, night and morning, the quantity of the sample depending on the quantity of the yield. The proper quantity can be obtained by the use of a "milk thief" and a bucket or can with straight sides or by taking a certain number of cubic centimeters for each pound of milk yielded. Each sample is then thoroughly stirred and mixed with the previous sample or samples to obtain the composite sample for testing. The percentage of butterfat in the composite sample is determined by the Babcock test. The butterfat percentage obtained by testing this sample is used as the average percentage for the month, and the monthly butterfat production is computed from it.

For small herds other methods of keeping milk and butterfat records may be used, such as weighing the milk from each cow for 1 day during the month and testing it for butterfat. The total yearly production of milk and butterfat from each cow, as shown by such tests, will be close enough to actual production for practical purposes. In some dairies the milk is weighed and tested 1 day every 2 months. This method is not so accurate as testing 1 day each month, but there is not a great deal of difference between the two methods.

In keeping a permanent record of each cow's monthly production of milk and butterfat and the percentage of fat, these may be entered on a large card or sheet with space enough for eight lactation records or years, or enough for the average productive life of a cow. There should be space for remarks on any unusual condition affecting the cow's production or health. On the back of the card may be recorded the cow's herd number, date of birth, name and registration number, and pedigree.

If a dairyman is a member of a dairy-herd-improvement association, the production records of his cows are kept by the DHIA supervisor hired by the association (fig. 12). The supervisor visits each member's herd 1 day each month, weighs and tests the milk of individual cows for that day, weighs the feed, and figures the total milk and butterfat production and the feed consumed for the month. At the end of the year the production of individual cows and the entire herd is summarized. This has proved to be an economical and reliable method of keeping herd-production records for a number of dairymen in a community. Additional information on dairy-herd-improvement associations is given in Farmers' Bulletin 1974, The Dairy Herd Improvement Association Program. The herd-testing plan described on page 27, which has been adopted by most dairy cattle breed associations, serves essentially the same purpose.

BREEDING RECORDS

A record should be made of the date of breeding, the bull used, and the date of expected calving. The average gestation period for Ayrshires, Holsteins, and Jerseys is approximately 279 days; for Guernseys, about 284 days; and for Brown Swiss, about 290 days.

FIGURE 12.—The DHIA supervisor tests the milk for percentage of butterfat.

Table 2 gives a gestation table based on the 279-day period. For Guernsey cows add 5 days to the due date as given in the table, and for Brown Swiss add 11 days.

It is well to have the breeding record both in a small pocket-size notebook that can be carried in the work clothes and in some other permanent form not so likely to be lost. Most of the national dairy-breed associations distribute small record books and blanks of this kind. Such books are especially helpful if the herd includes registered animals.

An example of a breeding and calving record, which illustrates a very simple and convenient method for recording breeding and freshening dates, follows. A small card is made out for each female in the herd, and the set of cards is kept in a small filing box. On one side of the card near the top is written the herd number, name, and date of birth of the animal, also the names of her sire and dam. On the lower portion the freshening dates, sex of each calf, and the sire of each calf are listed. The opposite side of the card is used for listing the breeding dates and the sire to which the cow was bred. Similar cards can be used for males.

REGISTRATION AND IDENTIFICATION

When a calf is dropped or a new animal is added to the herd, it should be assigned a name or number, and to avoid conflict the numbers should not be repeated. Many breeders attach to an animal's ear a fiber-disk eartag on which the herd number is stamped. This tag is about the size of a quarter and is

TABLE 2.—*Gestation table for cows*

Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due	Served	Due
Jan.	Oct.	Feb.	Nov.	Mar.	Dec.	Apr.	Jan.	May	Feb.	June	Mar.	July	Apr.	Aug.	May	Sept.	June	Oct.	July	Nov.	Aug.	Dec.	Sept.
1	7	1	7	1	5	1	5	1	4	1	7	1	6	1	7	1	7	1	7	1	7	1	6
2	8	2	8	2	6	2	6	2	5	2	8	2	7	2	8	2	8	2	8	2	8	2	7
3	9	3	9	3	7	3	7	3	6	3	9	3	8	3	9	3	9	3	9	3	9	3	8
4	10	4	10	4	8	4	8	4	7	4	10	4	9	4	10	4	10	4	10	4	10	4	9
5	11	5	11	5	9	5	9	5	8	5	11	5	10	5	11	5	11	5	11	5	11	5	10
6	12	6	12	6	10	6	10	6	9	6	12	6	11	6	12	6	12	6	12	6	12	6	11
7	13	7	13	7	11	7	11	7	10	7	13	7	12	7	13	7	13	7	13	7	13	7	12
8	14	8	14	8	12	8	12	8	11	8	14	8	13	8	14	8	14	8	14	8	14	8	13
9	15	9	15	9	13	9	13	9	12	9	15	9	14	9	15	9	15	9	15	9	15	9	14
10	16	10	16	10	14	10	14	10	13	10	16	10	15	10	16	10	16	10	16	10	16	10	15
11	17	11	17	11	15	11	15	11	14	11	17	11	16	11	17	11	17	11	17	11	17	11	16
12	18	12	18	12	16	12	16	12	15	12	18	12	17	12	18	12	18	12	18	12	18	12	17
13	19	13	19	13	17	13	17	13	16	13	19	13	18	13	19	13	19	13	19	13	19	13	18
14	20	14	20	14	18	14	18	14	17	14	20	14	19	14	20	14	20	14	20	14	20	14	19
15	21	15	21	15	19	15	19	15	18	15	21	15	20	15	21	15	21	15	21	15	21	15	20
16	22	16	22	16	20	16	20	16	19	16	22	16	21	16	22	16	22	16	22	16	22	16	21
17	23	17	23	17	21	17	21	17	20	17	23	17	22	17	23	17	23	17	23	17	23	17	22
18	24	18	24	18	22	18	22	18	21	18	24	18	23	18	24	18	24	18	24	18	24	18	23
19	25	19	25	19	23	19	23	19	22	19	25	19	24	19	25	19	25	19	25	19	25	19	24
20	26	20	26	20	24	20	24	20	23	20	26	20	25	20	26	20	26	20	26	20	26	20	25
21	27	21	27	21	25	21	25	21	24	21	27	21	26	21	27	21	27	21	27	21	27	21	26
22	28	22	28	22	26	22	26	22	25	22	28	22	27	22	28	22	28	22	28	22	28	22	27
23	29	23	29	23	27	23	27	23	26	23	29	23	28	23	29	23	29	23	29	23	29	23	28
24	30	24	30	24	28	24	28	24	27	24	30	24	29	24	30	24	30	24	30	24	30	24	29
25	31		Dec.	25	29	25	29	25	28	25	31	25	30	25	31		July	25	31	25	31	25	30
	Nov.	25	1	26	30	26	30		Mar.		Apr.		May		June	25	1		Aug.		Sept.		Oct.
26	1	26	2	27	31	27	31	26	1	26	1	26	1	26	1	26	2	26	1	26	1	26	1
27	2	27	3		Jan.		Feb.	27	2	27	2	27	2	27	2	27	3	27	2	27	2	27	2
28	3	28	4	28	1	28	1	28	3	28	3	28	3	28	3	28	4	28	3	28	3	28	3
29	4	29	5	29	2	29	2	29	4	29	4	29	4	29	4	29	5	29	4	29	4	29	4
30	5			30	3	30	3	30	5	30	5	30	5	30	5	30	6	30	5	30	5	30	5
31	6			31	4			31	6			31	6	31	6			31	6			31	6

EXAMPLE OF A CONVENIENT BREEDING AND CALVING RECORD

(FRONT OF CARD)

2456 BDI Gentle Avanette 2845934 Born Feb. 23, 1947

Sire: Rose Hill Emperor Governor 743882.
Dam: Lady Hark Burk Pride Gerb Colan Wat 2311557.

Freshened:	*Calf*	*Sire of Calf*
Apr. 16, 1949	Female No. 2847 (81 pounds)	Governor.
Aug. 1, 1950	Male No. 3125 (94 pounds)	H–24 art.
Oct. 27, 1951	Female No. 3055 (108 pounds)	H–24 art.
Nov. 16, 1952	Female No. 3095 (90 pounds)	H–24 art.
Dec. 11, 1953	Female No. 3433 (77 pounds)	3164.

(BACK OF CARD)

Bred:	*Bull used*	Bred—Continued	*Bull used*
May 8, 1948	Gov. art.	Jan. 21, 1951	H–24 No. 86 art.
July 14, 1948	Gov. art.	Feb. 10, 1952	H–24 No. 141 art.
Sept. 16, 1949	802 No. 3 art.	Mar. 6, 1953	3164.
Oct. 31, 1949	H–24 No. 23 art.	Mar. 18, 1954	H–8 No. 133 art.

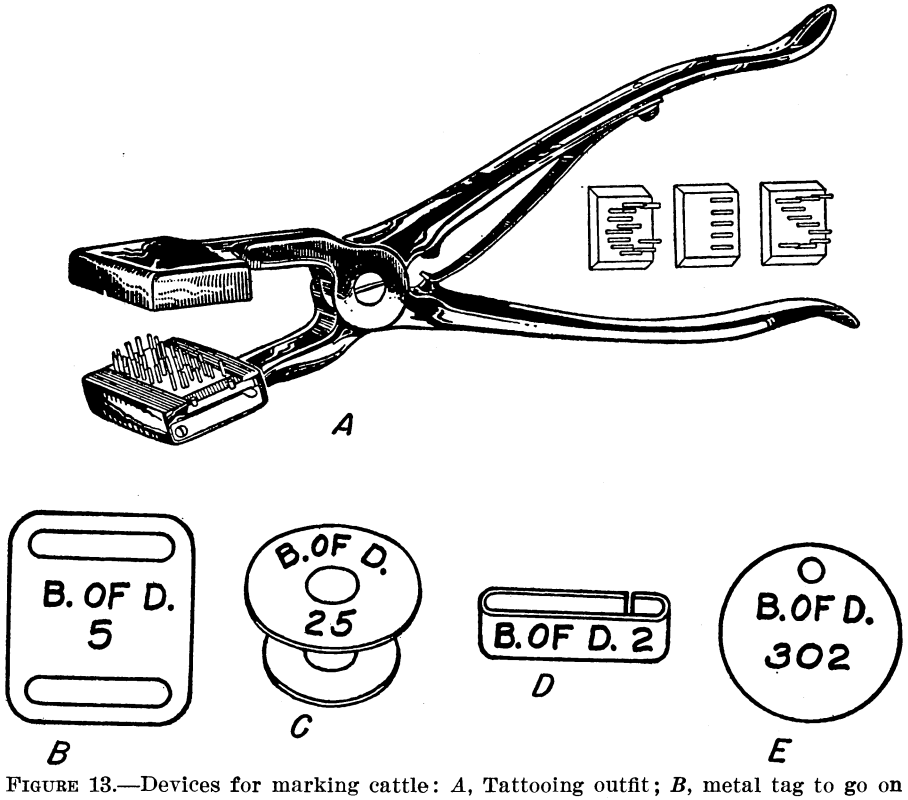

FIGURE 13.—Devices for marking cattle: *A*, Tattooing outfit; *B*, metal tag to go on strap around neck; *C* and *D*, metal eartags; *E*, fiber-disk eartag.

durable (fig. 13). It is attached with an ordinary hog ring and ringer, and if this is put on properly it is not easily torn out, nor is it easily confused with the small metal tags that may be placed in the ear for identification in tuberculin and Bang's disease testing.

A strap around the neck, to which is attached a metal tag with a herd number on it, is sometimes used. The strap will last for several years, and there is little likelihood of its being lost. However, straps are more expensive than fiber eartags. The practice of slitting or notching the ears for identification is not recommended because it makes the ear look ragged.

Some breeders tattoo numbers in the ears of their animals, and such marks are required for identification by some breed associations. Tattooing outfits are on the market. If the tattooing is properly done, it will last for the lifetime of the animal. However, the tattoo marks do not show distinctly on animals having dark skins. Even on light skins the tattoo numbers are often difficult to make out, and it is necessary to catch and hold the animal in order to see them.

Supervisors of dairy-herd-improvement associations are expected to eartag and record all calves dropped in the members' herds. This practice affords the member a good identification system.

A diagram showing the color markings of broken-colored animals can be drawn on a loose-leaf form provided by the breed associations. On the opposite side of this form is usually a three- or four-generation blank pedigree. A form of this kind filled out for each animal in the herd and kept in a holder will be of great help to the owner.

Registration papers for all registered animals should be kept on hand. Calves should be registered as soon as practicable. The national dairy-breed associations furnish directions and advice for registration. Their names and addresses are:

The American Dairy Cattle Club, Interlaken, N. Y.
The American Guernsey Cattle Club, Peterborough, N. H.
The American Jersey Cattle Club, 1521 East Broad Street, Columbus 5, Ohio.
The American Red Danish Cattle Association, Marlette, Mich.
The Ayrshire Breeders Association, Brandon, Vt.
The Brown Swiss Cattle Breeders Association, Beloit, Wis.
The Holstein-Friesian Association of America, Brattleboro, Vt.

ADVANCED-REGISTER TESTING

The national dairy-breed associations have established advanced-register classes for purebred cows. Animals are entitled to entry in these classes when their production has reached a certain standard set by the association. Most of the breed associations have also adopted the herd-test plan under which all the registered cows of the herd are tested. The herd tests and those for entry into the advanced-register class are conducted by representatives of the State agricultural colleges or extension service. Rules and regulations for conducting them differ according to the breed and the kind of test undertaken. Information can be obtained by writing to the breed associations or the State agricultural colleges.

BUYING AND SELLING DAIRY CATTLE

RAISING VERSUS PURCHASING FOR REPLACEMENT

Many dairy cattle are bought and sold each year. A beginner pur-

chases cattle to establish his foundation herd. The owner of an established herd finds it necessary to dispose of surplus animals in order to maintain his herd at the desired size. Many dairy animals, because of old age, low production, disease, or unsoundness, are disposed of for beef. In some sections, especially those adjacent to market-milk centers, many dairymen do not raise young animals to replenish their herds but buy fresh cows when additional milk is needed. They believe this method is cheaper than raising calves and heifers on expensive milk and other feeds. In some other sections removed from market-milk centers, many dairymen make a considerable portion of their income by raising dairy cattle to sell.[3]

The general practice of replacing by purchasing is not conducive to improvement in the production of the herd. There is also the great danger of introducing disease when new animals from different herds are constantly brought in. Finally, this method provides little opportunity for the herd to increase in value, because mature animals are purchased, and their value will decrease. If young animals are raised for herd replacements, their value tends to increase as they grow to maturity.

POINTS TO OBSERVE IN PURCHASING DAIRY CATTLE

The buyer of dairy cattle is usually at a disadvantage, because in many cases production records are not available and he must rely largely on the appearance of the animals. If the buyer is inexperienced, he should obtain the advice of an experienced man. Several points should be kept clearly in mind.

(1) The breed and class of cattle to be purchased must be decided upon. Dry cows or bred heifers ship better than do milking animals and do not need attendance unless the distance is great. The danger of introducing mastitis into a herd is less when heifers are purchased. Often cattle of one particular class are in greater demand than those of another, and in some localities are consequently higher priced. For instance, during the flush-pasture season, when milk is relatively cheap, heavily milking cows usually are cheaper than cows bred to freshen in the fall and winter, when milk prices probably will be higher.

(2) A locality where the particular breed of cattle sought predominates is usually the best place in which to buy any considerable number of cattle. By buying where there are large numbers of cattle greater opportunity for selection is possible. If a buyer desires to purchase a carload (15 or 20 head), it may be necessary to examine 60 to 75 animals in order to secure those of the class desired.

(3) Only sound, healthy cattle should be bought. It rarely pays to buy unsound cows, such as those having faulty udders, knocked-down hips, etc. Even if the best judgment is used in making selections, some animals will be disappointing. Never purchase animals

[3] For information on raising dairy calves and heifers, see Farmers' Bulletin 1723, Feeding, Care, and Management of Young Dairy Stock.

from herds that show evidence of having contagious diseases.

The Federal-State accredited-herd and accredited-area plan for eradicating tuberculosis has reduced to a minimum the danger of purchasing animals infected with this disease (p. 37). All the States are now listed as modified accredited areas.

Brucellosis (Bang's disease) probably offers the greatest difficulty to purchasers of dairy cattle. The safest rule is to purchase animals from herds that are known to be free from this disease. Most States have laws requiring that all dairy cattle brought into the State and not intended for immediate slaughter must pass a negative blood test prior to entry into the State. In some States there are restrictions on the movement of cattle within a State. A system of testing and official recognition similar to the Federal-State plan for the eradication of tuberculosis is now in extensive operation and buyers of dairy cattle are more likely to obtain cattle free of brucellosis if they confine their purchases to herds in districts where area testing has been in operation for some time. It is still desirable, however, to depend on the blood test of the entire herd as well as the individual animal for the final determination of freedom from abortion disease. (See p. 37 for more detailed discussion of brucellosis and accepted methods of control.)

SHIPPING DAIRY CATTLE

Dairy cattle can be transported by motortruck or by rail. Over long distances it is usually advisable to ship them by rail. Cows in milk should have an attendant. A closed car is preferable to a stock car for shipping dairy cattle. The car should be well bedded, and provision should be made for feeding and watering en route. In most cases, if enough good hay to last the cattle en route is provided, no other feed will be necessary. One or two clean barrels should be filled with water with a float on top or a canvas cover to keep the water from slopping out. Buckets with which to water the animals should be provided. If the barrels do not hold sufficient water to last the entire trip they can be refilled at stops. If barrels and buckets are provided, the train crew will see that the animals are watered.

The car should be thoroughly cleaned and disinfected before cattle are loaded into it. This disinfecting is best accomplished by thorough spraying with an efficient disinfectant.

In shipping young animals, it may be best to turn them loose in the car, or if there are only a few of them they can be penned in one end.

It is best to tie cows, preferably in the ends of the car, and leave space in the center of the car for barrels, buckets, and extra feed. Additional information on shipping cattle is contained in United States Department of Agriculture Leaflet 38, Maintaining the Health of Livestock in Transit.

COMMON AILMENTS OF DAIRY COWS

INDIGESTION

Indigestion, also termed "off feed," is one of the most common disorders suffered by dairy cattle. The condition is seen in various degrees of severity, depending on the cause and the digestive organs affected. In most cases the response to simple treatment is prompt and complete. Accurate determination of the cause of the ailment aids materially in the treatment.

Common causes of indigestion in dairy cows may be too much concentrated feed, damaged feed, lack of water, extremes of temperature, greedy eating, ketosis or acetonemia, penetration of the rumen by foreign bodies, and abdominal infections.

The treatment consists of eliminating the cause as well as treating the animal. This may require a thorough cleaning of feed boxes and mangers as well as the removal of remains of spoiled feed. Sources of feed such as grain bins, hay mows, or pastures should be examined for the presence of feed or plants which may be of a harmful nature. If improper feed is the cause of the difficulty, a laxative drench of Epsom salts is usually in order. The medicine is dissolved in water, placed in a bottle, and given through the mouth. A simple drenching tube for giving larger quantities of fluid may be made from a piece of rubber hose and a tin funnel.

In drenching, care must be taken not to strangle the animal and cause the fluid to be taken into the lungs, thereby causing serious consequences or death. The animal's head should be held only high enough to allow the fluid to run back easily into the mouth. If the head is held up by a rope, the rope should be wrapped around some object (not tied) so that it can be released instantly and the head lowered if there are any signs of choking. If the animal is held by the nose, care must be taken that it is still able to breathe through the nose. In giving any drench, particularly oily liquids, the medicine must be given slowly enough to allow the animal to swallow. Some animals in their refusal or inability to swallow will allow fluids to run into their lungs, causing almost immediate death. Since drenching may be followed by disaster to the animal it should only be attempted by an experienced person or the attending veterinarian.

BLOAT

Bloat may be produced by any kind of feed which causes indigestion and forms gas in the paunch. Young clover and alfalfa pasture are especially likely to cause bloat, although soybean hay, alfalfa hay, and other feeds may sometimes produce the trouble. The conditions that appear to be most favorable for the development of gases in the paunch when cattle are pastured on clover and alfalfa are high moisture content and immaturity of the herbage, a pure stand of the clover or alfalfa, and overeating by the cattle when first put in the pasture. Investigations have been made to

determine what chemical property is responsible for bloat but so far the matter is still unsettled.

Methods that have been advocated to prevent bloat are: Always give the animals a good fill of other feed before they are turned on the clover or alfalfa pasture. Thereafter keep them on the pasture continuously enough so that they will not become so hungry as to overeat. The herbage should not be wet with dew or rain when the cattle are first turned on the pasture. Provide either some dry roughage in the pasture which the cattle can eat at will or give them access to a pasture in which grasses rather than legumes predominate. Allowing the alfalfa to reach a fair degree of maturity before turning the cattle on it appears a less dangerous practice than pasturing it when very immature. However, because of differences in climate and types of feedstuffs, none of these methods have proved successful in all sections of the country. It is hoped that more information on this troublesome problem will become available as a result of research now underway on rumen physiology and digestion.

In cases of bloat the paunch is inflated most noticeably on the left side. In severe cases the distention may extend above the back. When tapped with the fingers the paunch gives a drumlike sound. When bloat is pronounced, the animal has difficulty in breathing. Place a rope, hose, or bit of some kind in the animal's mouth, and exercise the animal by compelling it to walk. Making the animal stand with the front feet higher than the hind feet may be helpful. The purpose of this treatment is to get rid of the gas through the mouth. If this treatment is not effective, give 2 tablespoonfuls of turpentine or formalin in 1 quart of warm water as a drench. Of these two remedies the turpentine is preferable. After bloating has subsided, give 1 pound of Epsom salts in 3 pints of warm water as a drench. If these remedies are not effective and in urgent cases where the gas must be allowed to escape without delay, it may be necessary to puncture the paunch. This is best done with a trocar and cannula. The trocar is a sharp-pointed instrument which fits smoothly into a hollow tube called the cannula, leaving the sharp point exposed. After inserting the trocar and cannula by a quick, firm thrust inward, downward, and forward, the trocar is pulled out and the cannula left in the opening. This will allow the gas to escape. The paunch is punctured on the left side with the trocar at a point equidistant from the last rib, the hip bone, and the loin. However, a trocar should be used only in cases of extreme emergency, as harmful infection is likely to result from its use. When there is time, it is better practice to use a stomach tube to relieve the bloated condition and for subsequent medication of the animal.

The animal should be fed sparingly on easily digested feed for several days after bloating has stopped, so that all fermenting material may pass out of the stomach.

NAILS OR WIRE IN THE STOMACH

Cows will eat pieces of wire, nails, small stones, and other objects when mixed with their feed, if in the bedding, or anywhere within reach. There is one compartment of the stomach where such material is collected and held. Most of it does no apparent harm, but occasionally a sharp-pointed object punctures the wall of the stomach and either pierces the heart or other vital organ or sets up an infection which eventually is fatal. Pieces of wire 2 or 3 inches long, of the kind used for baling wire or light fencing, are the most common causes of trouble of this sort.

The symptoms first noticed are general depression, refusal of feed, and reluctance to move. If infection has been set up by the foreign body the animal may have a fever. When a cow is suffering from a wire or nail coming in contact with the heart or the sac surrounding the heart, the breathing becomes short and often each respiration is accompanied by a gentle grunt. The heart beats much faster than normal. Sometimes, in advanced stages, the splash caused by the beat of the heart in the fluid surrounding the heart is plainly audible, and the brisket may become swollen.

Affected cows nearly always die. Operations to remove the foreign bodies have been performed successfully by skilled veterinarians, but generally by the time the trouble can be definitely diagnosed, it has progressed to a stage where an operation will not save the animal's life. The usual treatment consists in keeping the animal as quiet as possible and in avoiding the feeding of large quantities of roughage.

In combating this trouble the dairy farmer must rely upon prevention rather than cure. Pliers instead of a hatchet or ax should be used for cutting the wire on baled hay or straw since they sever the wire at one cut and there is less likelihood that short pieces will be broken off and mixed with the hay or straw. The use of baling wire for making repairs or for other purposes around the cow stall should be avoided. The use of string bale ties should eliminate much of the hazard encountered from the use of wire ties. Fencing that is falling apart on account of rust should be disposed of, as cows often reach under the fence to get grass. Some farmers and most feed manufacturers have provided magnets for removing wire and other metals (especially iron or steel objects) from all ground feed, but so far no practical method has been devised for removing such objects from roughage.

WARTS ON THE TEATS

Warts on the teats may sometimes attain sufficient size to interfere with milking. One method of removing them is to apply castor oil or pure olive oil after each milking for a week. If this treatment fails, the warts can be touched with a stick of lunar caustic and the oil applied after that. Long warts that are not too large at the base may be removed by tying a silk thread tightly around the wart

near the teat and allowing the thread to remain until the wart drops off.

CRACKED TEATS

Sometimes a cow's teats chap in the winter from exposure and cold when they are moist. The remedy is to milk with dry hands and to see that the teats are dry when the cow is turned out into the cold. Wet milking and the sucking of the calf make them more likely to chap. In case cracking occurs, the treatment consists in keeping the teats soft with applications of oil or salve. This will protect them from excessive drying and continued cracking.

DIFFICULT CALVING

Usually a cow will calve without assistance if she is not disturbed. At calving time she should be placed in a clean, well-bedded stall. Before labor has progressed to any great extent, it is well to see that presentation of the fetus is normal; that is, that the front feet and nose are first to appear. Sometimes one or both feet or the head is doubled back. When this occurs, calving without assistance is difficult or impossible. The calf should be placed in proper position to be delivered and this usually necessitates pushing it back into the uterus, an operation which is sometimes rather difficult. Unless a person is skilled in such work it is better to call a veterinarian than to attempt it unaided. A bungled job may mean serious laceration of the uterus or vagina, or death of the cow or calf. Calves can be born hind feet first. When this occurs, someone should be on hand to see that delivery is hastened at the critical moment; that is, when the blood supply to the calf through the navel cord is shut off. The calf must then be able to start breathing or it will smother.

Sometimes assistance is needed, especially by young cows, even when the presentation is normal. Hence the cow should be watched rather closely, but no help should be given unless it is necessary. Time must be allowed for the relaxation of the openings from the uterus and vagina. In general, labor should continue for several hours before any help is given, although the condition of the cow should be taken into consideration. She should not be allowed to become too much exhausted before receiving help.

In helping the cow, take hold of the calf's feet if they protrude; otherwise pass cotton ropes around them, and pull only when the cow strains. The direction of the pull should incline toward the cow's hocks and not be directly away from her body.

As soon as the calf is born, clip the navel cord about 1 inch from its belly, squeeze out the few drops of blood, and apply tincture of iodine.

RETENTION OF THE AFTERBIRTH

The afterbirth is usually expelled within a few hours after the birth of the calf, but if it is not expelled naturally within 36 to 48 hours a veterinarian should be consulted. The use of estrogenic hormones, as prescribed by a veterinarian, are of

value in contracting the uterus, thus expelling excessive fluids. The afterbirth usually can be removed by tension within a few days after treatment has been initiated. However, if this cannot be done, it may be necessary to have the afterbirth removed manually. In the event toxic or septicemic symptoms occur, the animal should receive systemic and local medication. Cows with retained afterbirth should be kept out of the milking stable and away from other cows.

MILK FEVER

Milk fever is a disease that generally attacks mature cows that have had three or four calves. It usually occurs within 3 days after the cow calves. It may, however, attack any cow at any time during her lactation period or a day or two before calving. High producers or fat cows are more subject to milk fever than low producers or thin cows. It is thought that plenty of water and salt and very little concentrated feed for several days before and after calving will help prevent this disease.

Milk fever may be recognized by the cow's staggering gait and lack of control of her hind legs. As the disease progresses the cow goes down in a stupor, lying in a normal position, except that her head is usually turned to her flank. Later, paralysis may become general, and then the cow lies on her side.

One method of treatment consists of inflating each quarter of the udder with air filtered through a liquid or cotton. Every dairyman should keep a milk-fever outfit on hand for quick use. Satisfactory outfits can be bought, or they can be made at little expense from a bicycle pump, rubber tubing, a piece of large glass tubing in which to place the cotton, and a milk tube. Care must be exercised to have the milk tube sterile, and the ends of the teats should be cleansed with a disinfecting solution. After inflation the teats should be tied with tape to prevent the escape of the air. Ordinarily one inflation is sufficient; but in case the cow shows no improvement in 2 hours, the inflation should be repeated. See that the cow lies on her brisket rather than flat on her side. Bags or bales of straw or hay can be used to prop her in position.

Another method of treatment consists of injecting calcium gluconate intravenously. This is the preferable treatment since it eliminates the possibility of infecting the udder, which sometimes occurs when the udder is inflated with air.

STERILITY

Sterility, or barrenness, is prevalent in dairy herds and may be temporary or permanent. Its presence interferes with the normal increase of the herd and leads to the maintenance of an excessive number of dry cows.

A number of causes may result in failure of a cow to conceive. Sometimes the fault is with the cow, sometimes with the bull. Each case, therefore, must be considered separately, both as to its cause and to its treatment.

Some cows may be sterile because of some dietary deficiency; of in-

flammation, cysts, tumors, or other disorders of the genital organs; of lack of tone in the genital organs; of arrested development of certain generative organs; or of bacterial or parasitic infection. There are so many things that may cause sterility, many of which are so difficult to identify definitely, or diagnose, that no one type or kind of treatment will correct sterility in a herd of cows unless by chance they should all be sterile from the same cause and the treatment given should happen to be the one that was a specific for that particular cause. This is the reason that some cows may appear to be helped by the feeding of sprouted oats or cottonseed meal, whereas other cows do not appear to be benefited by such treatment; some cows appear to be benefited by the massage of the genital organs by a trained operator, but others are not. In some cases, heat periods may sometimes be induced by massaging the ovaries. Usually it is advisable to have a veterinarian diagnose the cause of the sterility, when possible. If the cause can be definitely diagnosed there is much greater probability of restoring the animal to normal breeding condition.

Many temporarily sterile cows are benefited by a rest period on good pasture.

Cows with relaxation or lack of tone of the uterus may not conceive. Their genital organs hang far forward in the abdominal cavity as if they were entirely inactive. Either treatment with hormones or manipulation of the genital organs by a skilled operator, or both, will restore many such cows to breeding usefulness.

Two venereal diseases, trichomoniasis and vibriosis, are recognized in cattle in this country. These diseases are spread at the time of natural service, either by infected bulls to cows or by infected cows to bulls. The organisms causing these diseases are carried in the prepuce or sheath of infected bulls and inoculated into the vagina of the cow mechanically at the time of service or into semen collected in the artificial vagina and spread to the cow by artificial insemination. No lesions are produced in the bull, and a diagnosis is dependent on isolation and identification of the causative organism. Bulls are not known to recover spontaneously from these diseases. Although treatment is successful in most cases, it is costly and time-consuming and usually is limited to valuable animals. The addition of antibiotics to infected semen is believed to prevent the spread of Vibrio fetus. In contrast, Trichomonas fetus cannot be controlled by the addition of drugs to infected semen.

The clinical symptoms of both diseases are similar in the cow. The majority of infected females apparently fail to conceive when bred and repeatedly return to service. The abortion rate for both diseases usually is below 5 percent. Neither disease has been found in virgin heifers, but these heifers are very susceptible when bred to an infected bull. Most infected cows become pregnant eventually. Trichomoniasis is self-limiting in cows. Open cows become free of the disease after

three heat periods during sexual rest. This is true also in the majority of cows infected with vibriosis. However, some cows remain infected indefinitely and continue to spread the disease. Treatment is not satisfactory. Satisfactory conception rates have been restored in infected herds by the use of artificial insemination.

INFECTIOUS AND CONTAGIOUS DISEASES

COWPOX

Cowpox is an infectious disease which causes characteristic sores on the udder and teats. Tenderness and redness of the teats occur first, and are followed by an eruption of grayish-red nodules. A vesicle or blister filled with transparent fluid forms in the center of each nodule within 7 to 10 days. Later the fluid becomes purulent, and the final drying out of the lesion results in scab formation. Milking or handling the udder or teats during the pustular stage may result in rupturing the blisters, and consequently may interfere with the healing of the lesions as well as spread the infection to other cows.

Treatment consists of healing the sores left by the blisters. Any oil or neutral ointment is a very good remedy, as it keeps the affected parts soft, thus preventing cracking and bleeding. Since this disease is commonly carried from one cow to another by the milkers, the affected animal or animals should be milked last; and, as a further safeguard, the milker should cleanse his hands after milking each cow in the herd. For additional information, see Farmers' Bulletin 1422, Udder Diseases of Dairy Cows.

FOUL FOOT

Foul foot is rather common in dairy herds. This disease causes great reduction in milk flow as well as rapid loss of weight of the animal. The hind feet are most likely to be affected. It is thought that infection from stable filth gains entrance through an abrasion or from foreign matter wedging and remaining between the claws until irritation is set up. The affected foot becomes inflamed, sore between the claws, and gives off an offensive odor.

Treatment should be administered at the first sign of the disease. If it is delayed, the trouble may become more or less chronic and spread to the joints of the legs or to other parts of the body. Clean the affected part and treat it with a strong disinfectant. Newer methods of treatment with sulfa drugs and antibiotics are very effective when given at an early stage. These treatments require skilled operators and special techniques and therefore should be given either by a veterinarian or under his supervision. In advanced cases the animal should be confined to a clean stall, or it may be necessary to put a pad and bandage between the claws to keep out dirt until healing takes place.

TUBERCULOSIS

Tuberculosis is an infectious disease. It may be introduced into a herd by bringing in diseased ani-

mals, by allowing cattle access to streams of water which have been polluted by the droppings of tuberculous animals, by feeding calves raw milk from tuberculous cows, by shipping cattle in infected cars, or by pasturing them with infected cattle.

Most dairymen are familiar with the plans in effect for the control and eradication of bovine tuberculosis. Under these plans the cattle are retested periodically and any that react to the test are eliminated from the herd. All counties in the 48 States are now in what is known as the modified accredited area, indicating that they are practically free of bovine tuberculosis. Puerto Rico and the Virgin Islands are also in that category.

Continuation of existing programs of the periodical retesting is essential if recurrence of the disease is to be prevented.

For information on the rules and regulations for the control and elimination of tuberculosis in your State, write to your State veterinarian.

BRUCELLOSIS (BANG'S DISEASE)

Brucellosis, also known as Bang's disease and infectious abortion, is an infectious disease of cattle which causes heavy losses to dairy farmers. Cows infected with the disease produce about 20 percent less milk than noninfected cows in the same herd.

The organisms responsible for brucellosis are mostly present in the uterus and udder of an infected cow, particularly at the time immediately before, during, and after calving. Large numbers of the organisms may be expelled when such a cow calves or aborts a fetus and the infection may thus be spread over the premises or to other cattle. Isolation of cows in separate stalls for several days before and after calving, together with a blood test to detect infected cows, is a good procedure to follow in preventing the spread of infectious discharges. Such precautions at calving time are especially valuable since cattle usually contract the disease by consuming infected feed or water and by licking aborted material or discharges from infected cows. In handling or disposing of the fetus, milk, afterbirth, or like material from a known brucellosis-infected cow, care should be taken to do the work in a sanitary manner. Such matter should either be burned or deeply buried in the ground and covered with quicklime. Under no circumstances should these materials be allowed to remain on the premises where cattle or other stock might have contact with them. Because this disease may also be contracted by man in the form of undulant fever, care must be exercised in handling the infected material. The hands and arms should be washed thoroughly and this should be followed by a suitable disinfectant. Milk products from an infected cow are potentially dangerous unless boiled or properly pasteurized.

In the past decade, Federal-State cooperative programs have eliminated a great deal of brucellosis infection in cattle herds. With the development of strain 19 vaccine by the United States Department of

Agriculture, calfhood vaccination has become a promising means of control. Calves between 6 and 8 months of age vaccinated with strain 19 develop an increased resistance to brucellosis. This method, if judiciously used as recommended, holds great promise for the eventual eradication of bovine brucellosis. The Federal Government now offers several suggested plans of attack suited to the needs of the herd owner, which involve vaccination of the calves and the immediate or gradual elimination of all infected animals. With the continual introduction of resistant stock, and the removal of reacting animals as soon as it can be done without disturbing the herd economy, the disease in time may be eliminated from a herd. Vaccination programs of this sort will succeed best if conducted under veterinary supervision and in conjunction with the regulations governing such matters that are sponsored by the various State livestock authorities. Otherwise confusion may arise over the certification of vaccinated animals and their subsequent movement to other herds or shipment in interstate channels. For information on the plan for control of brucellosis in your State, write to your State veterinarian.

MASTITIS (MAMMITIS OR GARGET)

Mastitis is the most generally accepted term for an infectious, inflammatory condition in the udder which results chiefly from the presence of one or more of several species of harmful bacteria. It may be found in one or all four quarters at the same time and usually is in one of two forms—acute or chronic.

Acute mastitis generally is indicated by a hot, hard, painful, or swollen condition of the udder. It is apt to be accompanied by systemic disturbances in the cow such as lack of appetite, listlessness, lowered milk secretion, and a rise in body temperature; and it is almost invariably associated with some change in the milk. The change may be in the color, taste, or smell of the milk, or the milk may be stringy or watery and contain flakes or clots.

Chronic mastitis may cause general hardness in one or all quarters. The hardness of the udder tissue may occupy a quarter completely or it may take the form of variable-sized lumps. The lumps may be deeply hidden in the udder structure or they may be observed externally by only casual inspection. Udders affected with chronic mastitis are often distorted from their normal contour. Flaky milk in the strip cup, sudden decrease in milk flow, failing appetite, or a swollen udder or quarter may be the first symptom of the disease. It may be detected also through various chemical tests applied to the milk from infected quarters.

Mastitis may be caused by an initial bacterial invasion of the udder as a result of udder or teat injuries; exposure of the udder to cold, wet surfaces; or poor feeding practices. In addition, chronic mastitis may result from an acute attack of the disease, or it may be a "flare-up"

from a previous attack in a chronically infected quarter.

Mastitis may be transmitted from cow to cow in any manner which permits the bacteria to gain entrance to the udder. The bacteria may be transmitted by the milker's hands, teat cups of the milking machine, dirty udder cloths, or infected milk spilled on the floors or bedding. Flies feeding on the milk residues at the end of the teats after milking have also been suggested as a means of spreading udder infections.

More than ordinary care is necessary for the prevention of mastitis, but even under the best of conditions it is not always possible to prevent the disease. However, there is a reasonable chance to hold its occurrence to a minimum by the strict observance of certain rules of cleanliness. Cleanliness is not an expensive practice in a dairy barn and, when properly carried out, it will pay for its cost. Every dairyman should recognize the importance of keeping cows' udders clean and healthy, keeping barns and floors as clean as possible, and thoroughly cleaning all milking equipment after each milking.[4] Cows having known cases of infection in their udders should be kept separate from the other cows, especially at milking time, and the infected cows should be milked last. Washing each cow's udder a few minutes before milking, with an individual clean towel soaked in a chlorine solution (200 parts of chlorine per million parts of water) not only stimulates the milk flow but is good sanitary practice.

If a case of mastitis is discovered, it demands immediate attention if the best results are to be obtained from treatment measures.

As a beginning treatment, the affected animal should be placed by herself in a comfortable stall if possible. Grain should be reduced or removed from the ration, and the general intake of feed should be reduced to discourage heavy milk production for the time being. If the animal shows a tendency toward constipation she should have an adequate dose of Epsom salts dissolved in water. A hot-water bag, or some other suitable means of holding hot water (110° F.) in contact with the udder, should be applied to the udder for an hour at least once a day. The udder or infected quarter should be milked out several times a day and sanitary disposal made of the strippings. The udder surface should be kept well lubricated with a suitable ointment to assist in relieving the congestion and aid in massaging the swollen gland.

For internal medication of the udder the local veterinarian should be consulted. Several treating agents are now available, such as combinations of the various sulfa compounds, colloidal silver compounds, and antibiotics such as penicillin, tyrothricin, streptomycin, aureomycin, terramycin, and bacitracin. While these drugs are fairly effective against the more common types of organisms that cause mastitis, the veterinarian can

[4] See Farmers' Bulletin 2078, Cleaning and Sanitizing Farm Milk Utensils.

judge from results of the milk tests which drug will give more than a reasonable degree of success depending on the type and extent of the infection. However, most of these drugs have a very selective range of activity and should be used only against the type of infection for which they are specifically recommended, and none of them can insure against subsequent infection. It must be emphasized that their careless, indiscriminate use can be costly as well as disappointing.

As very small quantities of these drugs in the milk may cause serious difficulty in cheesemaking and other phases of milk processing, milk from treated quarters should be discarded for at least 3 days after the last treatment.

For those cases of udder infection which fail to respond to treatment and represent a serious menace to other cows, removal of the affected animal from the herd as soon as practicable is the best solution. If possible, replacements should be made from animals grown on the premises. Outside replacements should be brought in only when it can be determined that they are free of disease.

Additional information on mastitis is given in Farmers' Bulletin 1422, Udder Diseases of Dairy Cows.

INSECT PESTS [5]

WARBLES

Warbles or grubs, which appear in the backs of cattle beneath the skin during a period of 4 or 5 months in the fall, winter, and spring, are the larval stage of the warble fly or heel fly. The flies attach their eggs to the hair about the heels and legs of the cattle, causing them much annoyance at the time. The eggs hatch in a few days and the young grubs burrow into the skin, causing further annoyance and irritation. The grubs soon begin to work their way upward through the muscles and into the body cavities of the animal. They eventually reach a position under the skin along the back, from which they emerge to complete the life cycle in about a year.

The annoyance and irritation from the flies and grubs causes the animals to lose flesh, and, in the case of milking cows, probably causes a lowered milk production. In addition, the holes made by the grubs as they emerge through the skin cause the hide to have a lower sales value.

Applications of fly sprays are probably of little value for protection against heel flies. Removal of the grubs from the backs of the cattle, by pressing with the fingers beneath the lump in the hide, is a common method of control. Removal of the grubs can be accomplished readily where only a few animals are involved, or where the infestation is light. In larger herds, the use of sprays, powders,

[5] Information on the control of insect pests of dairy cows was supplied by the Entomology Research Division, Agricultural Research Service, U.S. Department of Agriculture. Additional information relating to insects affecting dairy cows and their control may be obtained from that Division.

or washes made of derris powder is effective. Use 7½ pounds of 5-percent rotenone powder to 100 gallons of water. This mixture, when sprayed under 2 to 3 hundred pounds pressure to the backs and sides of cattle, kills the grubs without removal by squeezing. A wash made with 12 ounces of derris powder (5-percent rotenone), 1 gallon of water, and 2 ounces of soap, and briskly rubbed in with a brush, has given 100-percent kill in many cases. Effective remedies are available commercially. For additional information see Farmers' Bulletin 1596, Cattle Grubs or Heel Flies, With Suggestions for Their Control.

LICE

The first effects of infestation by lice are usually a scurfy skin and patches of falling hair, particularly around the head, neck, withers, brisket, and tail head. Unless the lice are killed, the animal may lose much of its hair and develop sores over its body. Young animals or those that are in poor condition as a result of feeding or management problems are especially affected.

Rotenone and pyrethrum are the only insecticides recommended for control of lice on dairy cows being milked. Rotenone sprays should be prepared by mixing 1 to 2 pounds of a 5 percent dust in 100 gallons of water. Two applications 14 to 18 days apart are necessary. Pyrethrum sprays should contain 0.025 percent of pyrethrins and 0.25 percent of a synergist such as piperonyl butoxide, or MGK 264. Two treatments may be required for complete control, but in some instances satisfactory control can be obtained with one treatment.

Louse treatment should be supported by thorough brushing of the animals. Barns and stalls should be scrubbed out with a 10-percent solution of creolin or other suitable disinfectant. All litter should be removed from the barn daily.

FLIES

Flies are a nuisance around a dairy not only because they annoy the cows and attendants, but because they are a source of contamination to the milk. They soil the walls and utensils with their excrement and cause general insanitation in the milk room and dairy barn.

The three species of flies commonly found around the dairy premises are the housefly, the stablefly, and the horn fly. The greatest offenders are the housefly and the stablefly. The housefly, while unable to bite the animals with its sucking mouth parts, does annoy cattle by its presence. It has also been definitely incriminated as a spreader of disease germs as well as a general contaminator of the premises. The stablefly annoys chiefly by its biting and blood feeding habits. Cows have difficulty in feeding properly or standing quietly to be milked when heavily infested with stableflies. The horn fly is also a blood feeder and, although not so troublesome as the two other species, tends to form in swarms and at times becomes a source of annoyance to cattle.

All three species of flies mentioned breed in filth accumulations.

One of the first considerations in fly control is to remove or cover all material used by flies for breeding places. The housefly lays its eggs in refuse or other decaying vegetable matter. The stablefly lays its eggs in manure, wet and rotten straw, or other decayed vegetation. The horn fly lays its eggs only on fresh cow manure. The manure should be removed from stables promptly and regularly, particularly during the fly season, and it should either be spread on the fields at once or composted. Composted manure should be covered with generous sprinklings of superphosphate to keep down the development of fly larvae.

Effective methods of controlling and killing flies have been developed with the introduction of the newer insecticides. These insecticides are available as aerosols; as dusts or powders; and in solution, suspensions, and emulsions of oil and water, for use as sprays. The type to use depends on the conditions under which it is to be used.

Aerosols spread the insecticide in a fine mist or fog and are used chiefly to kill the flies present in rooms or enclosures that can be closed tightly for a few minutes. They do not have a long-lasting effect. Dusts and powders, while effective, may be objectionable because the settling dust may cause contamination and unsightliness. Sprays are satisfactory when applied in the form of coarse (rather than fine) droplets, to be sure a sufficient quantity is left on the surface after it dries.

Pyrethrum and thiocynates such as Lethane or Thanite sprays are the only insecticides recommended for controlling the horn fly on dairy cattle. Synergized pyrethrum sprays usually control horn flies for 4 to 7 days. The emulsifiable concentrates are to be diluted with water to contain 0.05-percent of pyrethrins. These sprays usually are fortified with synergists such as piperonyl butoxide and MGK 264.

Stable flies are more difficult to control, but the above-mentioned insecticides will give some control against these biting insects. Most dairymen are familiar with oil sprays for controlling flies on cattle. They may contain pyrethrum preparations or from 3 to 5 percent of organic thiocynates. Not more than 1 or 2 ounces of spray should be applied per animal as a fine mist type of spray, moistening only the outer coat of hair. The mist treatment provides only temporary control so that daily treatments or two treatments each day, usually at milking time, are necessary.

Methoxychlor, Diazinon, malathion, and lindane are the only insecticides recommended as residual sprays for fly control in barns where cows are milked. Methoxychlor sprays should be used at 0.5 percent, lindane at 0.3 percent, and malathion and Diazinon at 1 percent concentrations. Houseflies have become resistant to insecticides in many parts of the country and are difficult to control by methoxychlor and lindane residual sprays. Malathion and Diazinon, however, are usually effective. Frequent use

of mist sprays containing pyrethrum is effective in the barn in many instances. Poison baits are being used successfully to control houseflies that have become resistant to insecticides. Effective liquid and dry baits for treating floors are commercially available. These contain malathion, Dipterex, or Diazinon. Further information on controlling flies is given in Leaflet No. 390, The Housefly—How to Control It.

Commercial insecticides are labeled with specific instructions and precautions concerning their use. These instructions should be carefully read and followed.

Rigid sanitary measures on the farm to remove fly breeding material are essential for good fly control.

BAD HABITS

KICKING

Kicking during milking is due largely to poor management. Many heifers kick when they are being broken to milk and must be carefully handled so that they will not form the habit. Sore or cracked teats also cause cows to kick. Never strike a cow for kicking. Such practice will excite her and make her worse. Some animals must be restrained while being milked. This is best accomplished by placing a heavy strap around the rear legs just above the hocks. Pass the strap around one leg, cross between the legs, and then around the other, drawing them close together. Unless crossed in the middle, the strap will slip down when the cow struggles.

SUCKING

Every dairyman has had experience with cows that suck themselves. There seems to be no satisfactory explanation of why they do this. To prevent the habit, many devices and methods have been tried with varying degrees of success. One device may work successfully on one cow and fail on another.

A device that can be recommended is a bit made of ½-inch pipe through which several small holes have been drilled. The bit is equipped with rings like those in a horse's bit, and is attached to the cow's halter with snaps. When the cow tries to suck, air is admitted through the holes in the bit and prevents suction. The bit should be removed occasionally and the holes cleaned. If the cow's mouth gets sore, remove the bit while she is standing in the stanchion.

DEHORNING

Horns are of no use to the dairy cow. She no longer needs to fight for self-protection or for the protection of her young. Cows with horns often injure one another in the stable or lot and sometimes accidentally injure attendants. Bulls with horns are decidedly more dangerous than those without. The only excuse for allowing animals to retain horns is appearance; it is very questionable, however, whether on most animals horns really improve the appearance. Still, horns do sometimes increase the selling price of an animal and may better its chances of winning in the show ring. As long as these conditions

exist, there will be owners who will want the horns left on their registered animals.

In dehorning cattle or in preventing horn growth, the skin from which the horn grows should be removed or destroyed. In the young calf, this skin covers the horn button; later it lies at the base of the horn and surrounds it. When young calves are a few days to a week old, the growth of horns may be permanently arrested by rubbing the horn button with a caustic stick (soda or potash) until the outer skin is removed. This can be done most easily as soon as the horn button can be located definitely. Other methods include use of caustic liquid, electric cautery, and the gouge. However, the caustic stick method is probably the most practical and humane.

Older cattle may be dehorned with a saw or clippers, or by the rubber band method. Experiments to compare the various methods indicate that use of a saw or clippers will give more uniformly efficient results than the rubber band method and will cause less suffering and loss of production in milking cattle. The skin at the base of the horns should be removed with the horns. If any of this skin is left, the horns will grow again and produce what are known as scurs.

If dehorning is done in cool weather, when there are no flies, wound treatment is unnecessary. Take precautions, however, to see that dirt, manure, or other filth does not contaminate the wound. Certain infections are soil or filth borne. Provide clean, well-bedded stalls or clean pastures for newly dehorned animals.

If dehorning is done in warm weather, it usually is necessary to apply a fly repellent such as pine tar to the wound.

In some sections, especially in the Southern States, severe screwworm infestations are common. In these areas, do not dehorn during screwworm season—tip the sharp horns. Use EQ 335 or Smear 62 as wound treatment and for controlling screwworm infestations.

Apply EQ 335 or Smear 62 with a 1-inch brush. Give a light coating to uninfested wounds caused by shear cuts, wire cuts, docking, dehorning, or castrating. To treat infested wounds, work EQ 335 or Smear 62 in well and apply a coating completely around the wound. Give special attention to any deep pockets made by the worms.

Repeat treatment at least twice a week until wounds are healed.

PRECAUTIONS

- Use as little EQ 335 as possible, only enough to treat the wound thoroughly.
- Newborn calves are susceptible to EQ 335 and similar lindane preparations. Navels or other wounds on newborn calves can be treated safely if no more than 2 or 3 teaspoonfuls of EQ 335 or other lindane preparation are applied at one time.
- Avoid getting EQ 335 on the hands. If any of it comes in contact with the skin, wash it off immediately.

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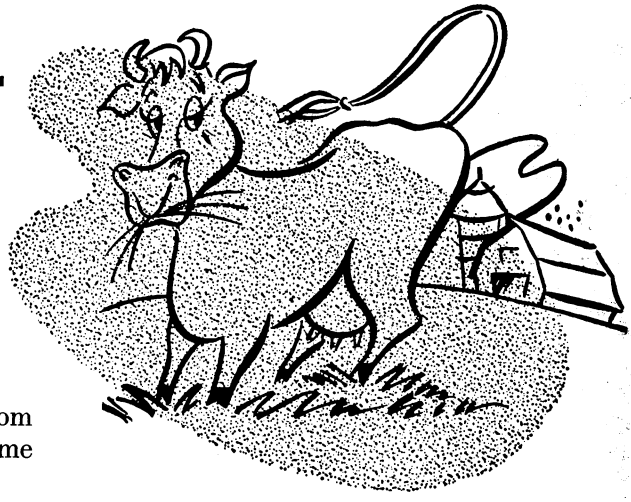
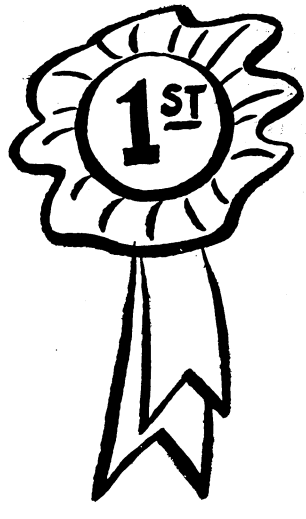
Improve Your Grasslands and . . .



- Cut your feed costs.
- Get more income from your grass and legume acreage.
- Build up and conserve your soil.
- Save work and cut your labor bill.
- Get higher yields from other crops in your rotation.



To Improve Your Grasslands . . .

- Seed varieties and strains that are adapted to your farm and to your feeding plans. Use high-quality seed. Buy certified seed if possible.
- Sow at the right time on a properly prepared seedbed.
- Fertilize and lime your soil.
- Control weeds, brush, and insect pests.
- Practice controlled and rotation grazing, where necessary.
- Plan pastures to provide good grazing as much of the year as possible.

For Details . . . *SEE YOUR COUNTY AGENT.*